

What Is Claimed Is:

- Dep. 91*
1. A laser diode module comprising:
 - a laser diode;
 - an optical system including an optical fiber and a lens portion, said optical system being configured to receive and transmit a beam emitted from said laser diode through said lens portion to said optical fiber along an optical axis;
 - a holder configured to receive a portion of said optical system;
 - a base having a holder mounting member and a fastening member, said holder being mounted to said fastening member at a first joint position, said fastening member being mounted to said holder mounting member at a second joint position; and
 - a bottom plate configured to support said base,wherein said first joint position and said second joint position are located at substantially a same distance from said bottom plate.
 2. The laser diode module according to Claim 1, wherein said holder is configured to receive a portion of said optical fiber.
 3. The laser diode module according to Claim 1, wherein said lens portion is a discrete lens supported by said holder mounting member.
 4. The laser diode module according to Claim 3, wherein said discrete lens is mounted within said holder.
 5. The laser diode module according to Claim 3, wherein:
 - said optical system further comprises a second lens; and
 - said laser diode module further comprises a package including said bottom plate, said package being configured to support said second lens and said optical fiber.
 6. The laser diode module according to Claim 3, wherein:

said optical system further comprises an optical isolator supported by said holder mounting member; and

said optical system is configured to receive and transmit the beam emitted from said laser diode through said discrete lens and said optical isolator to said optical fiber along said optical axis.

7. The laser diode module according to Claim 6, wherein:

said optical isolator is mounted to said holder mounting member at a third joint position; and

said first joint position, said second joint position, and said third joint position being located at substantially a same distance from said bottom plate.

8. The laser diode module according to Claim 6, wherein:

said optical isolator is mounted to said holder mounting member at a fourth joint position, said third joint position being located on a first surface of said optical isolator and said fourth joint position being located on a second surface of said optical isolator, said first surface being substantially perpendicular in orientation to said second surface; and

said first joint position, said second joint position, said third joint position, and said fourth joint position being located at substantially a same distance from said bottom plate.

9. The laser diode module according to Claim 1, wherein:

said holder is mounted to said fastening member at a plurality of first joint positions; said fastening member is mounted to said holder mounting member at a plurality of second joint positions; and

said plurality of first joint positions and said plurality of second joint positions are coplanar.

10. The laser diode module according to Claim 9, wherein said plurality of first joint positions include at least one joint position on a first side of said holder and at least one joint position on a second side of said holder opposite said first side.

11. The laser diode module according to Claim 9, wherein said plurality of second joint positions include at least one joint position on a first side of said fastening member and at least one joint position on a second side of said fastening member opposite said first side.

12. The laser diode module according to Claim 9, wherein said plurality of first joint positions are symmetrically oriented on opposing sides of said holder about said optical axis.

13. The laser diode module according to Claim 9, wherein said plurality of second joint positions are symmetrically oriented on said opposing sides of said fastening member about said optical axis.

14. The laser diode module according to Claim 1, wherein said holder is mounted to said fastening member at said first joint position by laser welding, and said fastening member is mounted to said holder mounting member at said second joint position by laser welding.

15. The laser diode module according to Claim 1, wherein said base includes a plurality of fastening members received within a corresponding plurality of recessed portions on said holder mounting member.

16. The laser diode module according to Claim 1, wherein said fastening member is coupled to said holder at a location adjacent said lens portion of said optical system.

17. The laser diode module according to Claim 1, further comprising a thermo module coupling said base to said bottom plate, said thermo module comprising a first plate member attached to a portion of said base, a peltier element attached to said first plate member, and a second plate member attached to said peltier element and said bottom plate.

18. The laser diode module according to Claim 1, wherein said first joint position and said second joint position are coplanar along a plane extending through a longitudinal axis of said optical fiber.

19. A laser diode module comprising:

a laser diode having an active layer;

an optical system including an optical fiber and a lens portion, said optical system being configured to receive and transmit a beam emitted from said laser diode through said lens portion to said optical fiber along an optical axis;

a holder configured to receive a portion of said optical system; and

a base having a holder mounting member and a fastening member, said holder being mounted to said fastening member at a first joint position, said fastening member being mounted to said holder mounting member at a second joint position, said first joint position and said second joint position are coplanar with said active layer of said diode.

20. The laser diode module according to Claim 19, wherein said holder is configured to receive a portion of said optical fiber.

21. The laser diode module according to Claim 19, wherein said lens portion is a discrete lens supported by said holder mounting member.

22. The laser diode module according to Claim 21, wherein said discrete lens is mounted within said holder.

23. The laser diode module according to Claim 21, wherein:

said optical system further comprises a second lens; and

said laser diode module further comprises a package including a bottom plate, said package being configured to support said second lens and said optical fiber.

24. The laser diode module according to Claim 21, wherein:

said optical system further comprises an optical isolator supported by said holder mounting member; and

said optical system is configured to receive and transmit the beam emitted from said laser diode through said discrete lens and said optical isolator to said optical fiber along said optical axis.

25. The laser diode module according to Claim 24, wherein:

said optical isolator is mounted to said holder mounting member at a third joint position; and

said first joint position, said second joint position, and said third joint position are coplanar with said active layer of said diode.

26. The laser diode module according to Claim 24, wherein:

said optical isolator is mounted to said holder mounting member at a fourth joint position, said third joint position being located on a first surface of said optical isolator and said fourth joint position being located on a second surface of said optical isolator, said first surface being substantially perpendicular in orientation to said second surface; and

said first joint position, said second joint position, said third joint position, and said fourth joint position are coplanar with said active layer of said diode.

27. The laser diode module according to Claim 19, wherein:

said holder is mounted to said fastening member at a plurality of first joint positions; and

said fastening member is mounted to said holder mounting member at a plurality of second joint positions.

28. The laser diode module according to Claim 27, wherein said plurality of first joint positions include at least one joint position on a first side of said holder and at least one joint position on a second side of said holder opposite said first side.

29. The laser diode module according to Claim 27, wherein said plurality of second joint positions include at least one joint position on a first side of said fastening member and at least one joint position on a second side of said fastening member opposite said first side.

30. The laser diode module according to Claim 27, wherein said plurality of first joint positions are symmetrically oriented on opposing sides of said holder about said optical axis.

31. The laser diode module according to Claim 27, wherein said plurality of second joint positions are symmetrically oriented on said opposing sides of said fastening member about said optical axis.

32. The laser diode module according to Claim 19, wherein said holder is mounted to said fastening member at said first joint position by laser welding, and said fastening member is mounted to said holder mounting member at said second joint position by laser welding.

33. The laser diode module according to Claim 19, wherein said base includes a plurality of fastening members received within a corresponding plurality of recessed portions on said holder mounting member.

34. The laser diode module according to Claim 19, wherein said fastening member is coupled to said holder at a location adjacent said lens portion of said optical system.

35. The laser diode module according to Claim 19, further comprising:

a bottom plate configured to support said base; and

a thermo module coupling said base to said bottom plate, said thermo module comprising a first plate member attached to a portion of said base, a peltier element attached

to said first plate member, and a second plate member attached to said peltier element and said bottom plate.

36. The laser diode module according to Claim 19, wherein said first joint position and said second joint position are coplanar along a plane extending through said optical axis.

37. A laser diode module comprising:

a laser diode;

an optical system including an optical fiber and a lens portion, said optical system being configured to receive and transmit a beam emitted from said laser diode through said lens portion to said optical fiber along an optical axis;

a holder configured to receive a portion of said optical system; and

a base having a holder mounting member and a fastening member, said holder being mounted to said fastening member at a plurality of first joint positions, said fastening member being mounted to said holder mounting member at a plurality of second joint positions, said plurality of first joint positions and said plurality of second joint positions are coplanar.

38. The laser diode module according to Claim 37, wherein said holder is configured to receive a portion of said optical fiber.

39. The laser diode module according to Claim 37, wherein said lens portion is a discrete lens supported by said holder mounting member.

40. The laser diode module according to Claim 39, wherein said discrete lens is mounted within said holder.

41. The laser diode module according to Claim 39, wherein:

said optical system further comprises a second lens; and

said laser diode module further comprises a package including a bottom plate, said package being configured to support said second lens and said optical fiber.

42. The laser diode module according to Claim 39, wherein:

said optical system further comprises an optical isolator supported by said holder mounting member; and

said optical system is configured to receive and transmit the beam emitted from said laser diode through said discrete lens and said optical isolator to said optical fiber along said optical axis.

43. The laser diode module according to Claim 42, wherein:

said optical isolator is mounted to said holder mounting member at a plurality of third joint positions; and

said plurality of first joint positions, said plurality of second joint positions, and said plurality of third joint positions are coplanar.

44. The laser diode module according to Claim 42, wherein:

said optical isolator is mounted to said holder mounting member at a plurality of fourth joint positions, said plurality of third joint positions being located on a first surface of said optical isolator and said plurality of fourth joint positions being located on a second surface of said optical isolator, said first surface being substantially perpendicular in orientation to said second surface; and

said plurality of first joint positions, said plurality of second joint positions, said plurality of third joint positions, and said plurality of fourth joint positions are coplanar.

45. The laser diode module according to Claim 37, wherein said plurality of first joint positions and said plurality of second joint positions are coplanar along a plane extending through said optical axis.

46. A semiconductor laser diode module comprising:

a laser diode;

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an optical system including an optical fiber and a lens portion, said optical system being configured to receive and transmit a beam emitted from said laser diode through said lens portion to said optical fiber along an optical axis;

a holder configured to receive a portion of said optical system;

a fastening means for fixing said portion of said optical system by supporting and clamping said holder on sides thereof;

a base configured to support said fastening means and said laser diode, said base including a fastening means mounting member configured to mount said fastening means; and

a bottom plate configured to support said base, said fastening means, said holder, said optical system, and said laser diode,

wherein a first welding position is obtained by welding said fastening means to said fastening means mounting member and a second welding position is obtained by welding said fastening means and said holder, and

wherein said first welding position and said second welding position are at substantially a same height in a direction perpendicular to said bottom plate.

47. The semiconductor laser diode module according to Claim 46, wherein said holder is configured to receive a portion of said optical fiber.

48. The semiconductor laser diode module according to Claim 46, wherein said lens portion is a discrete lens supported by said fastening means mounting member.

49. The semiconductor laser diode module according to Claim 48, wherein said discrete lens is mounted within said holder.

50. The semiconductor laser diode module according to Claim 48, wherein:
said optical system further comprises a second lens; and

said semiconductor laser diode module further comprises a package including said bottom plate, said package being configured to support said second lens and said optical fiber.

51. The semiconductor laser diode module according to Claim 48, wherein:

said optical system further comprises an optical isolator supported by said fastening means mounting member; and

said optical system is configured to receive and transmit the beam emitted from said laser diode through said discrete lens and said optical isolator to said optical fiber along said optical axis.

52. The semiconductor laser diode module according to Claim 51, wherein:
said optical isolator is mounted to said fastening means mounting member at a third welding position; and

said first welding position, said second welding position, and said third welding position are at substantially a same height in a direction perpendicular to said bottom plate.

53. The semiconductor laser diode module according to Claim 52, wherein:

said optical isolator is mounted to said fastening means mounting member at a fourth welding position, said third welding position being located on a first surface of said optical isolator and said fourth welding position being located on a second surface of said optical isolator, said first surface being substantially perpendicular in orientation to said second surface; and

said first welding position, said second welding position, said third welding position, and said fourth welding position are at substantially a same height in a direction perpendicular to said bottom plate.

54. The semiconductor laser diode module according to Claim 46, further comprising:

a thermo module mounted on said bottom plate, said base being mounted on said thermo module; and

a package configured to accommodate said laser diode, said optical system, said holder, said fastening means, said base and said thermo module, said package including said bottom plate.

55. The semiconductor laser diode module according to Claim 46, wherein said base projects in a longitudinal direction of said optical fiber from an end portion on an optical fiber mounting side of said thermo module.

56. The semiconductor laser diode module according to Claim 55, wherein:

said base includes a laser diode mounting member configured to mount said laser diode at a laser diode mounting region and disposed on said thermo module;

said fastening means mounting member is disposed in a position other than said laser diode mounting region; and

said fastening means mounting member projects in said longitudinal direction of said optical fiber from an end portion on an optical fiber mounting side of said laser diode mounting member.

57. The semiconductor laser diode module according to Claim 56, wherein said laser diode mounting member has a reinforcement portion configured to mechanically reinforce said fastening means located in a closest position to said laser diode, and wherein said reinforcement portion has a lower surface that is out of contact with said thermo module.

58. The semiconductor laser diode module according to Claim 46, wherein said lens portion has a fiber lens formed on said optical fiber, and wherein said fiber lens has a tip end side that is arranged opposite a light emitting facet of said laser diode.

59. The semiconductor laser diode module according to Claim 58, wherein said fiber lens is an anamorphic lens.

60. The semiconductor laser diode module according to Claim 46, wherein said fastening means mounting member is formed of an Fe-Ni-Co alloy.

61. The semiconductor laser diode module according to Claim 46, wherein said fastening means is formed of an Fe-Ni-Co alloy.

Patent No. 6,734,330